

DESCRIPTIONS OF VARIOUS SEEDLINGS OF LEGUMINOUS PLANTS

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ABSTRACT

Thirty-six species of leguminous plants (Mimosaceae, Caesalpinaceae and Fabaceae) from Australia, Africa and the United States belonging to Acacia, Bauhinia, Cassia, Erythrina, Parkinsonia and Prosopis are illustrated and described.

The legumes, in the broad sense, belong to one of the largest of the flowering plant families. Many legumes are of economic importance as green vegetables, an important source of drugs and medicines, animal fodder, and in the tropics a source of firewood. Many leguminous species are weedy. As a result, special concern has been given to the identification of leguminous seedlings so that good forest and pasture management can be practiced in the developing countries of the world.

Seedlings are often different from the adult stage. The juvenile leaves of leguminous seedlings are often simpler than the adults. The first true leaves are often simple, while the later leaves are often

compound with the number of leaflets increasing gradually until it reaches the constant number of the species.

In this paper, seeds of leguminous plants were obtained by Dr. James A. Duke of the Economic Plants Laboratory, United States Department of Agriculture, Beltsville, MD from a variety sources. The seeds were sown in the greenhouse of the Department of Botany, University of Maryland, College Park, MD. Of the 38 species of seeds obtained for this study, most germinated and produced healthy seedlings. A few became diseased and died at an early age. Two species, Acacia senegal and Prosopis tamarugo, failed to germinate.

Seedlings of six genera were

The present paper was prepared in the United States. An opportunity to visit the United States from September 1982 to September 1983 allowed me to do this work and prepare the present paper for publication. This was done at the Department of Botany, University of Maryland, College Park, MD. Dr. James A. Duke, Germplasm Resources Laboratory, U.S. Department of Agriculture, Beltsville, MD, obtained the seeds from a variety of sources and presented them to me. The seedlings were grown in the greenhouse at the University of Maryland. Dr. James L. Reveal of the University assisted me in preparing this paper for publication. This is Scientific Article A3559, Contribution No. 6634 of the Maryland Agricultural Experiment Station.

examined: Acacia and Prosopis (Mimosaceae); Bauhinia Cassia and Parkinsonia (Caesalpiniaaceae); and Erythrina (Fabaceae). The species are arranged alphabetically in the following section. The illustrations are arranged accordingly and follow the same sequence.

1. Acacia acuminata Benth.

Root system with many laterals. Hypocotyl pale green, suffused with purple, glabrous, ca 20 mm long. Cotyledons foliaceous, 3x6 mm, oblong, becoming reflex when the seedling at the 3-leaf stage and deciduous at the 6-leaf stage, sessile; apex rounded; base somewhat auriculate; upper surface green; under surface pale green and suffused with purple. First leaf pinnate with 3 or 4 pairs of leaflets; petiole 4-6 mm long, pubescent, somewhat purplish. Second leaf bipinnate with one pair of pinnae; pinna with 2-4 pairs of leaflets; petiole 4-8 mm long, pubescent and somewhat purplish. Third to sixth leaves bipinnate and otherwise similar to the second leaf only with the petiole flattened and the seventh leaf reduced to a phyllode. Stipule scale-like, caducous. Leaflets 2x4 mm-2.5x6 mm, obovate-oblong; apex minutely apiculate; base obtuse, oblique; upper surface green; under surface pale green; margin pubescent. Flattened petiole 25-35 mm long, 2-3 mm wide, pubescent, somewhat purplish. Epicotyl not evident. Internode short, less than 5 mm long in the 4-leaf stage.

Fig. 1. Seedlings stages of Acacia acuminata: a) 2 days old; b) 5 days old; c) 25 days old. Source: Seedlot No. 11150. Locality: Harrogin, Western Australia. Germination time: 9 days.

2. Acacia albida Delile

Root system with some laterals; taproot yellowish with the outer layer soon eroded and brownish. Hypocotyl pale green, glabrous, 30-45 mm long. Cotyledons foliaceous, somewhat fleshy, 5x9 mm, ovate to elliptic, sessile; apex rounded; base auriculate; upper surface green; under surface pale green; nerves conspicuous. First leaf bipinnate with 1 pair of pinnae; pinna with about 7 pairs of leaflets; petiole ca 6 mm long, pubescent. Second to fifth leaves same as the first. Stipule spinous, ca 2 mm long. Leaflets oblong, ca 2x5 mm, glabrous, green; apex rounded; base rounded or obtuse, oblique. Epicotyl conspicuous in 5-leaf stage. Internodes up to 8 mm long, pubescent, green.

Fig. 2. Seedling of Acacia albida: 17 days old. Source: Seedlot No. ISRA/CNRF Senegal (821598). Locality: Senegal. Germination time: 17 days.

3. Acacia aneura F. Muell.

Root system with few laterals; taproot white with the outer layer soon eroded and brownish. Hypocotyl pale green and somewhat purplish, glabrous, 30 mm long. Cotyledons foliaceous, 3x6 mm, oblong, glabrous, sessile; apex rounded; base somewhat auriculate; upper surface green; under surface pale green. First leaf pinnate with 2 pairs of leaflets; petiole 5 mm long, glabrous, green. Second leaf bipinnate with 1 pair of pinnae; pinna with 2 or 3 pairs of leaflets. Third leaf petiole flattened or all leaves reduced to a phyllode. Fourth leaf reduced to a phyllode. Stipules scale-like, green. Leaflets 2x6 mm or 3x8 mm, oblong or obovate-oblong, green, glabrous; apex

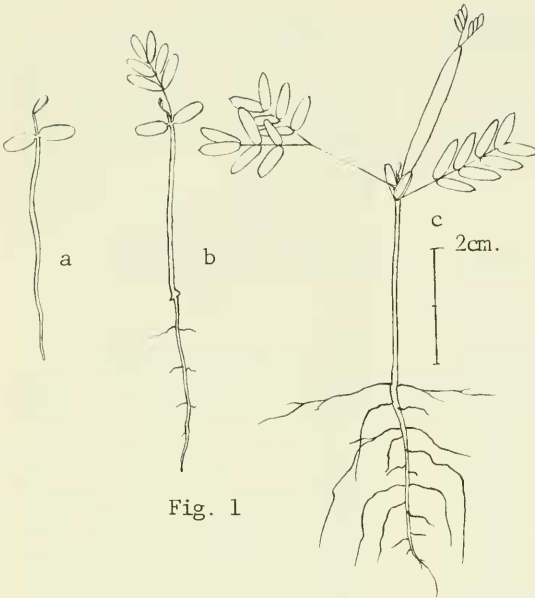


Fig. 1

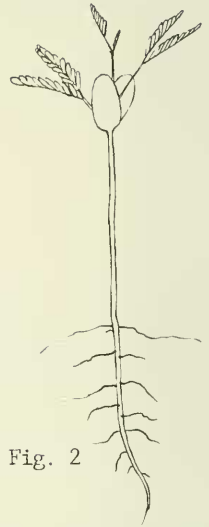


Fig. 2

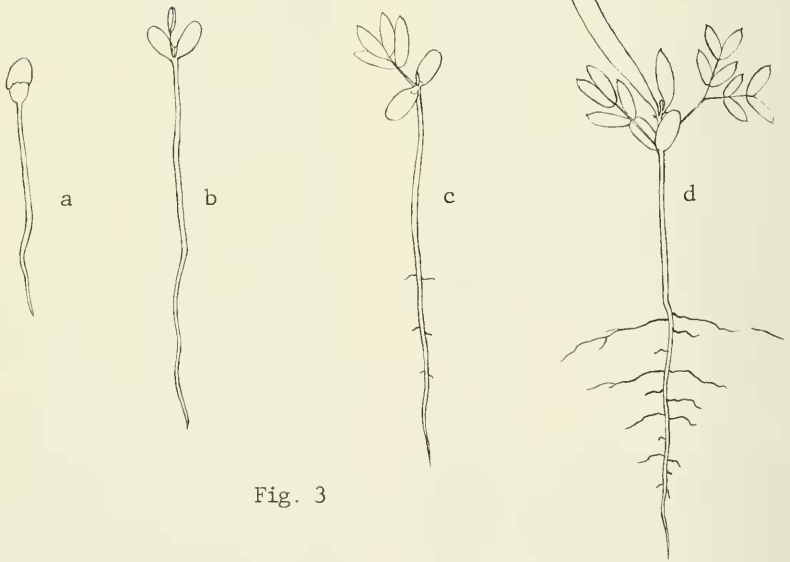


Fig. 3

minutely apiculate; base obtuse, oblique. Flattened petioles and phyllodes up to 40 mm long and 5 mm wide, somewhat curved like a sickle, tapering at both ends, green and shining, 3- or 5-nerved. Epicotyl not evident. Internodes less than 5 mm long in 5-leaf stage, pubescent.

Fig. 3. Seedlings stages of Acacia aneura: a) germinating seedling; b) 3 days old; c) 8 days old; d) 26 days old. Source: Seedlot No. 13481. Locality: 6 km east of Charleville, Queensland, Australia. Germination time: 5 days.

4. Acacia auriculiformis A. Cunn. ex Benth.

Root system with numerous laterals. Hypocotyl 30 mm long, glabrous, pale green, suffused with purple. Cotyledons foliaceous, 3x6 mm, oblong or elliptic, glabrous, sessile; apex rounded; base somewhat auriculate; upper surface green; under surface pale green and somewhat purplish, soon becoming green. First leaf pinnate with 4-6 pairs of leaflets; petiole 5 mm long, pubescent. Second leaf bipinnate with 1 pair of pinnae; pinna with 4 or 5 pairs of leaflets; petiole 10 mm long, pubescent. Third leaf same as the second one, only with a flattened petiole. Fourth leaf or more reduced to phyllodes. Stipules small, ovate, pubescent. Leaflets 3x8 mm-4x10 mm, oblong or obovate-oblong, green, glabrous; apex minutely apiculate or rounded; based rounded and oblique. Phyllodes 5x40 mm or more long, linear, tapering at both ends, green and shining, with 2 or 3 conspicuous nerves. Epicotyle not evident. Internodes up to 5 mm long in the 4-leaf stages, pubescent.

Fig. 4. Seedling stages of

Acacia auriculiformis: a) germinating seedling; b) 9 days old; c) 23 days old. Source: Seedlot No. 13191. Locality: Darwin, Northern Territory, Australia. Germination time: 10 days.

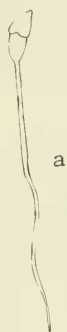
5. Acacia baileyana F. Muell.

Root system with numerous laterals; taproot white. Hypocotyl purplish, glabrous, up to 25 mm long. Cotyledons foliaceous, about 3x7 mm, oblong, soon reflexed and deciduous at the 2- or 3-leaf stage; apex rounded; base somewhat auriculate; upper surface deep green; under surface green and suffused with purple. First leaf pinnate with 4 or 5 leaflets; petiole ca 5 mm long, glabrous, pointed at the top of the rachis. Second leaf bipinnate with 1 pair of pinnae; pinna with 5 pairs of leaflets; petiole ca 7 mm long, glabrous or with scattered, minute hairs. Third and fourth leaves similar to the second leaf, but the petiole becoming longer. Eighth leaf bipinnate with 4 pairs of pinnae; petiole rounded, not at all flattened. Stipules small, scale-like, purple. Leaflets oblong or obovate-oblong, up to 2x9 mm, glabrous; apex minutely apiculate; base obtuse or rounded, oblique; upper surface green; under surface pale green and somewhat purplish. Epicotyl not evident. Internodes less than 5 mm long at 5-leaf stage, pubescent.

Fig. 5. Seedling stages of Acacia baileyana: a) germinating seedling; b) 9 days old. Source: Seedlot No. 11664. Locality: Canberra, Australia Capital Territory. Germination time: 10 days.

6. Acacia cambagei R.T. Baker

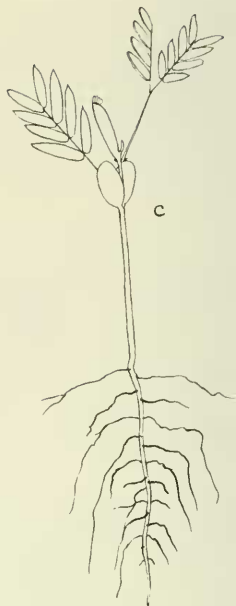
Root system with moderate lateral; taproot white with the



a

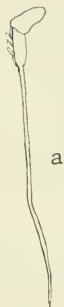


b

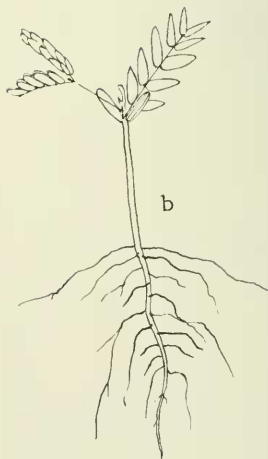


c

Fig. 4



a



b

Fig. 5

outer layer eroded and becoming yellowish-brown. Hypocotyl glabrous, pale green or somewhat purplish, terete, up to 35 mm long. Cotyledons foliaceous, somewhat fleshy, ca 10x12 mm, elliptic; apex rounded; base auriculate; upper surface green; under surface pale green; nerves inconspicuous. First leaf pinnate with 4 pairs of leaflets; petiole 10 mm long, glabrous, pale green; rachis pointed at the apex. Second leaf similar to the first one and opposite it. Third leaf or more reduced to phyllodes. Stipules scale-like, caducous. Leaflets ca 3x10 mm, oblong or ovate-oblong, glabrous, green; apex minutely apiculate or rounded; base obtuse, oblique. Phyllodes ca 45 mm long and 4 mm wide, linear, attenuated at both ends, pubescent with scattered, minute, appressed hairs, green and shining, 2 or 3 nerved. Epicotyle 1 mm long. Internode less than 5 mm long at 3-leaf stage, pubescent.

Fig. 6. Seedling stages of *Acacia cambagei*: a) germinating seedling; b) 3 days old; c) 19 days old. Source: Seedlot No. 13487. Locality: 98 km W of Winderah, Queensland, Australia. Germination time: 5 days.

7. *Acacia crassicarpa* A. Cunn. ex Benth.

Root system with numerous laterals. Hypocotyl purple, glabrous, 15-20 mm long. Cotyledons foliaceous, 3x8 mm, oblong, glabrous, sessile; apex rounded; base somewhat auriculate; upper surface green; under surface purple. First leaf pinnate with 3 pairs of leaflets; petiole 5 mm long, pubescent. Second leaf bipinnate with 1 pair of pinnae; pinna with 3 or 4 pairs of leaflets; petiole 8-20 mm long, pubescent. Third leaf same as the

second only the petiole flattened in some. Fifth leaf reduced to a phyllode. Stipules small, subulate. Leaflets 2x5 mm-3x7 mm, ovate-oblong, glabrous; apex acute or obtuse; base obtuse, oblique; upper surface green, under surface pale green or suffused with purple. Phyllodes 10x20 mm-15x60 mm, oblanceolate, green and shining, with an apex acute and attenuated base, 3-nerved. Epicotyl not evident. Internode up to 5 mm long at 5-leaf stage, pubescent.

Fig. 7. Seedling stages of *Acacia crassicarpa*: a) germinating seedling; b) 3 days old; c) 22 days old. Source: Seedlot No. 13367. Locality: 7 km from Daintree, Queensland, Australia. Germination time: 10 days.

8. *Acacia dealbata* Link

Root system with few laterals. Hypocotyl purple, glabrous, ca 20 mm long. Cotyledons foliaceous, 2.5x7 mm, oblong, glabrous, becoming reflexed when the first leaf unfolds and deciduous at 3-leaf stage; apex rounded; base somewhat auriculate; upper surface green; under surface purplish but becoming green. First leaf pinnate with 3 pairs of leaflets; petiole ca 5 mm long, pubescent. Second leaf bipinnate with 1 pair of pinnae; pinna with 4 pairs of leaflets; petiole ca 10 mm long, pubescent. Third leaf similar to second one; petiole flattened until the 10-leaf stage. Stipules small, scale-like, brown. Leaflets 2-6 mm-3x10 mm, oblong, glabrous; apex minutely apiculate or obtuse; based obtuse, oblique; upper surface green; under surface pale green and suffused with purple. Epicotyl not evident. Internodes up to 6 mm long or more at the 3-leaf stage, pubescent.

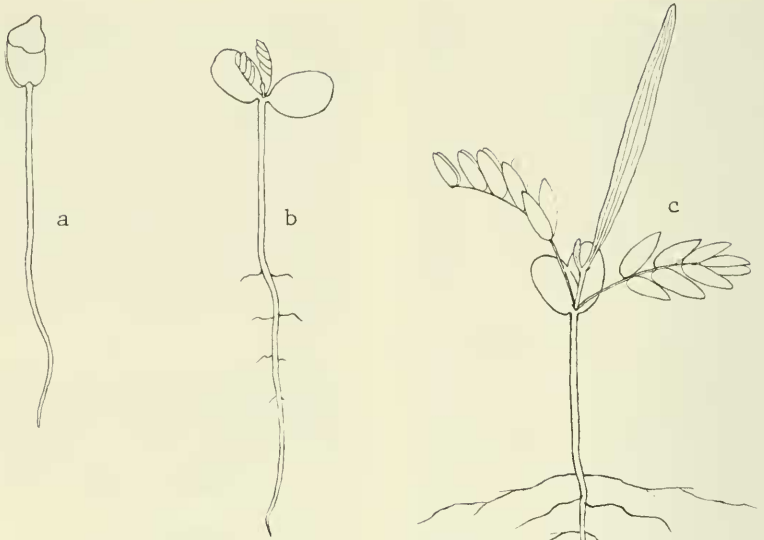


Fig. 6

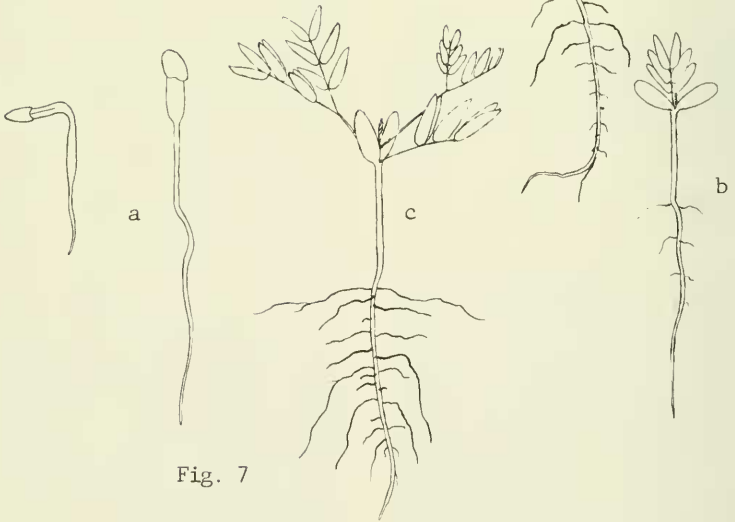


Fig. 7

Fig. 8. Seedling stages of *Acacia dealbata*: a) germinating seedling; b) 4 days old; c) 17 days old. Source: Seedlot No. 8874. Locality: Lake George, New South Wales, Australia. Germination time: 14 days.

9. *Acacia elata* A. Cunn. ex Benth.

Root system with numerous laterals; taproot white. Hypocotyl purple, glabrous, 15-20 mm long. Cotyledons foliaceous, 4x7 mm, oblong, glabrous, reflex and deciduous at the 3-leaf stage; apex rounded; base somewhat auriculate; upper surface purplish-green; under surface purple. First leaf pinnate with 4 or 5 pairs of leaflets; petiole about 5 mm long, purple, pubescent. Second leaf bipinnate with 1 pair of pinnae; pinna with 4 or 5 leaflets; petiole up to 20 mm long, purple, pubescent. Third leaf same as the second. Seventh to ninth leaves bipinnate with 2 pairs of pinnae; petiole rounded, not flattened. Stipules small, subulate, brown. Leaflets 3x5 mm-4.5-10 mm, oblong, glabrous; apex minutely apiculate; base rounded, oblique; upper surface purplish-green, becoming green when dry; under surface purple. Epicotyl not evident. Internode up to 7 mm long at 4-leaf stage, purple, pubescent.

Fig. 9. Seedling stages of *Acacia elata*: a) germinating seedling; b) 4 days old; c) 16 days old. Source: Seedlot No. 9972. Locality: Balmoral, New South Wales, Australia. Germination time: 15 days.

10. *Acacia excelsa* Benth.

Root system with few laterals; taproot with the outer layer soon eroded and brownish. Hypocotyl glabrous, somewhat purplish, ca 30 mm long. Coty-

ledons foliaceous, 3x7 mm, oblong, green but becoming yellowish at 3-leaf stage, sessile; apex rounded; base somewhat auriculate. First leaf pinnate with 2 pairs of leaflets; petiole slender, 4 mm long, glabrous, pale green. Second leaf bipinnate with 1 pair of pinnae; pinna with 2 pairs of leaflets. Third leaf (and subsequent leaves) reduced to phyllodes, occasionally with a few leaflets on the top of the third phyllode at the 3-leaf stage. Stipules small, ovate-oblong, pale green. Leaflets 2.5x5 mm-3.5x10 mm, oblong or obovate-oblong, green, glabrous; apex minutely apiculate; base obtuse, oblique. Phyllodes 4x20 mm-4x25 mm, oblanceolate, green and shining, with an apiculate apex and an attenuated base, 3-nerved. Epicotyl not evident. Internode less than 5 mm long at 5-leaf stage, purple, glabrous.

Fig. 10. Seedling stages of *Acacia excelsa*: a) germinating seedling; b) 3 days old; c) 10 days old. Source: Seedlot No. 13270. Locality: 40 km south of Charleville, Queensland, Australia. Germination time: 14 days.

11. *Acacia farnesiana* Willd.

Root system with numerous laterals; taproot yellowish. Hypocotyl pale green, glabrous, 20-30 mm long. Cotyledons foliaceous, somewhat fleshy, 8x14 mm, elliptic, glabrous; apex rounded; base auriculate; upper surface green; under surface green; petiole 2 mm long. First leaf pinnate with 6 pairs of leaflets; petiole 8 mm long, glabrous, green. Second leaf same as the first one only the leaflets larger and the petiole longer. Third leaf bipinnate with 1 or 2 pinnae; pinna with 5 or 6 pairs of leaflets; petiole 10 mm long. Forth and

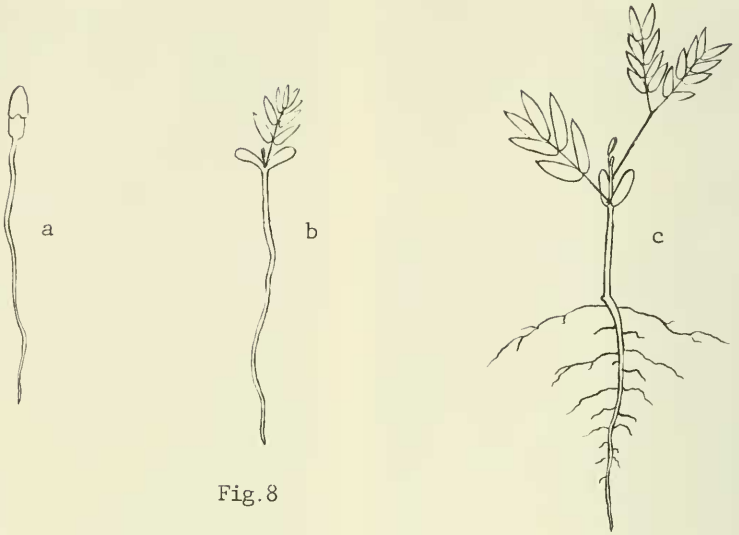


Fig. 8

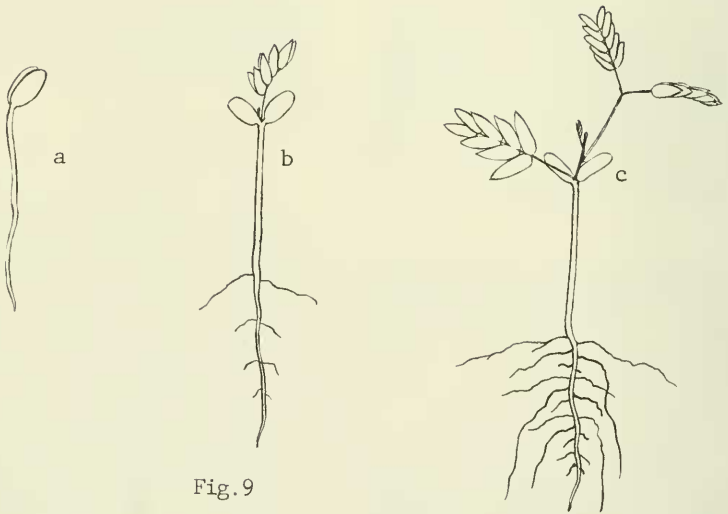


Fig. 9

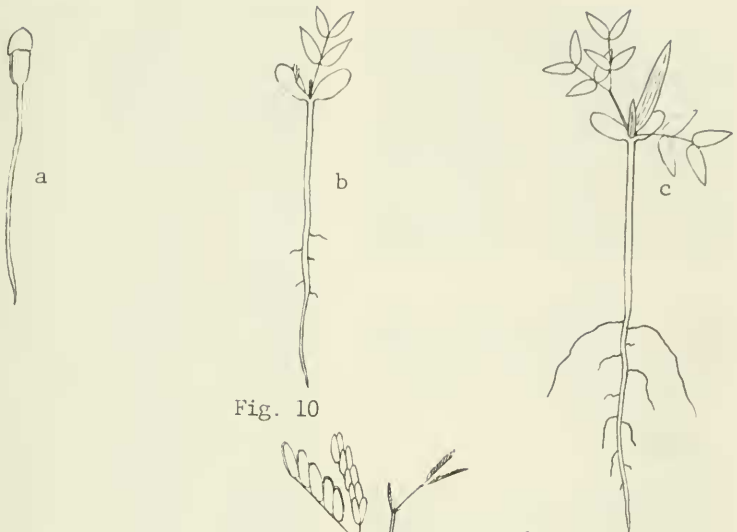


Fig. 10

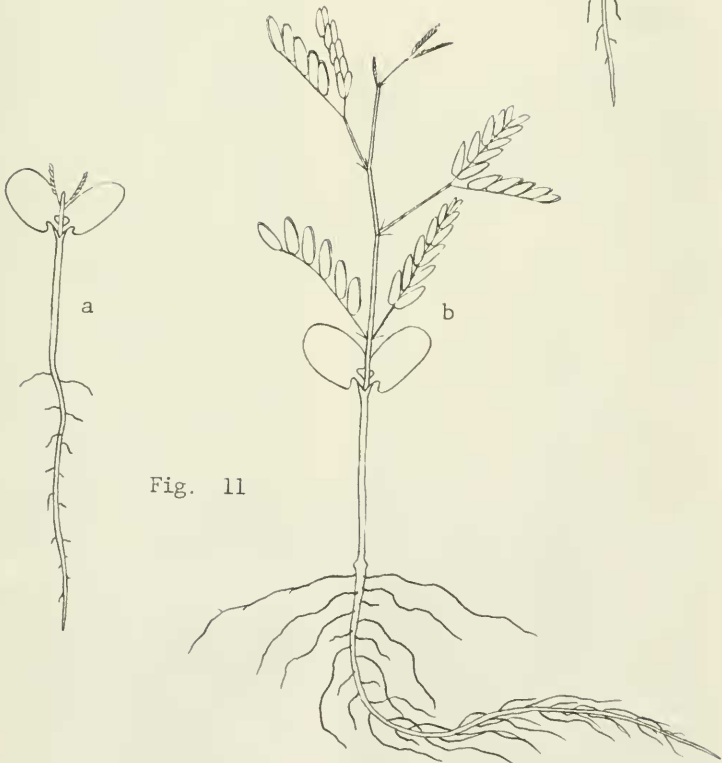


Fig. 11

fifth leaves similar to the third leaf. Stipules becoming spinous, stiffened, 5 mm long, ascending, purple. Leaflets 2x4 mm or 1.5x6 mm, elliptic or oblong, green, glabrous; apex rounded or obtuse; base rounded or obtuse, oblique; upper surface green; under surface pale green. Epicotyl 8 mm long. First internode ca 18 mm long at the 6-leaf stage, purplish-green, glabrous.

Fig. 11. Seedling stages of *Acacia farnesiana*: a) 3 days old; b) 14 days old. Source: CSIRO 11457. Locality: Australia. Germination time: 8 days.

12. *Acacia holosericea* A. Cunn. ex G. Don

Root system with many laterals; taproot white with the outer layer soon eroded. Hypocotyl glabrous, pale green and somewhat purplish, up to 35 mm long, terete. Cotyledons foliaceous, 2.5x7 mm, oblong, glabrous, sessile, soon reflexed and deciduous at the 3-leaf stage; apex rounded; base somewhat auriculate; upper leaf surface green; under surface pale green and somewhat purplish. First leaf pinnate with 2 pairs of leaflets; petiole ca 4 mm long, pale green. Second leaf bipinnate with 1 pair of pinnae; pinna with 4 pairs of leaflets; petiole ca 5 mm long, pubescent. Third and fourth leaves similar to the second one. Fifth to ninth leaf with flattened petioles. Tenth leaf reduced to a phyllode. Stipules small, scale-like, pale green. Leaflets ca 2x8 mm, oblong, obovate-oblong or obovate, green, glabrous; apex minutely apiculate; base obtuse, oblique; petiole flattened. Phyllodes linear or lanceolate, attenuated at both ends, green and shining, pubescent, 3- or 4-nerved. Epicotyl not evident. Internodes less than 5 mm long

at 5-leaf stage, pubescent.

Fig. 12. Seedling stages of *Acacia holosericea*: a) 4 days old; b) 20 days old. Source: Seedlot No. 11502. Locality: Sandfire Roadhouse, Great/N. Hwy., Western Australia. Germination time: 10 days.

13. *Acacia implexa* Benth.

Root system with abundant laterals; taproot white. Hypocotyl glabrous, pale purple, up to 40 mm long, terete. Cotyledons foliaceous, 2.5x10 mm, oblong, soon reflexed and deciduous by 3- or 4-leaf stage; apex rounded; base weakly auriculate; upper surface green; under surface pale green or somewhat purplish. First leaf pinnate with 6 or 7 pairs of leaflets; petiole ca 8 mm long, glabrous, pale green; rachis ca 25 mm long, subulate at the apex. Second leaf bipinnate with 1 pair of pinnae; pinna with 6 pairs of leaflets; petiole ca 10 mm long, glabrous. Third through fifth leaves similar to the second one, only the petiole gradually elongating. Sixth leaf with a flattened petiole. Seventh leaf becoming a phyllode. Stipules subulate, ca 1.5 mm long. Leaflets up to 2.5x8 mm, oblong to oblong-obovate, glabrous; apex rounded or minutely apiculate; base obtuse, oblique; upper surface green; under surface pale green or somewhat purplish. Epicotyl not evident. Internodes less than 5 mm long at the 4-leaf stage, glabrous.

Fig. 13. Seedling stages of *Acacia implexa*: a) 3 days old; b) 15 days old. Source: Seedlot No. 9738. Locality: Spicers Creek, New South Wales, Australia. Germination time: 10 days.

14. *Acacia mangium* Willd.

Root system with numerous

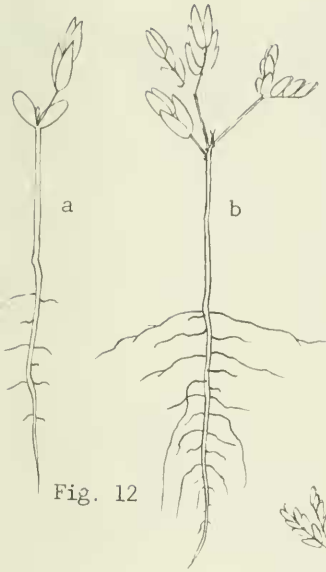


Fig. 12

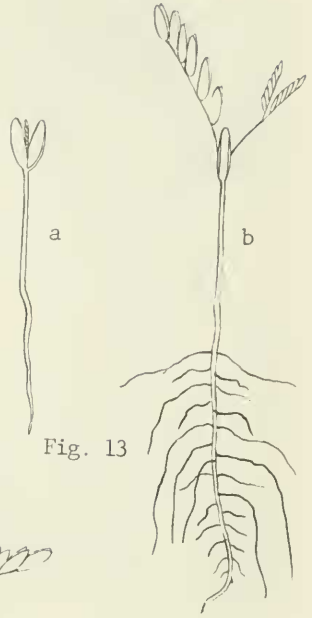


Fig. 13

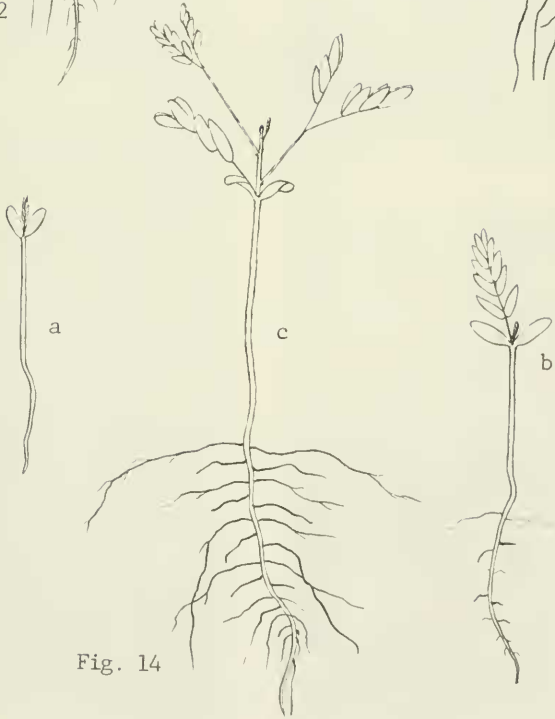


Fig. 14

delicate laterals. Hypocotyl glabrous, pale green and somewhat purplish, up to 30 mm long. Cotyledons foliaceous, ca 2.5x7 mm, oblong, glabrous; apex rounded; base weakly auriculate; upper surface green; under surface pale green and somewhat purplish. First leaf pinnate with 3-5 pairs of leaflets; petiole ca 5 mm long, pale green, pubescent; rachis ca 10 mm long. Second leaf bipinnate with 1 pair of pinnae; pinna with 3 or 4 pairs of leaflets; petiole ca 10 mm long. Third and fourth leaves similar to the second one but each pinna with more than 5 pairs of leaflets and the petiole longer. Stipules small, scale-like, pale green, pubescent. Leaflets up to 2.5x7 mm, oblong; apex minutely apiculate; base oblique; upper surface green; under surface pale green and somewhat purplish; margin pubescent. Epicotyl not evident. Internodes less than 5 mm long at the 4-leaf stage, pubescent.

Fig. 14. Seedling stages of *Acacia mangium*: a) 3 days old; b) 9 days old; c) 31 days old. Source: Seedlot No. 13534. Locality: Cassowary Range, Queensland, Australia. Germination time: 11 days.

15. *Acacia melanoxylon* R. Br.

Root system with numerous laterals. Hypocotyl glabrous, purple, ca 15 mm long. Cotyledons foliaceous, ca 2.5-7 mm long, oblong, glabrous; apex rounded; base minutely auriculate; upper surface green; under surface pale green and somewhat purplish. First leaf pinnate with 4-6 pairs of leaflets; petiole 5 mm long, pubescent; rachis ca 8 mm long. Second leaf bipinnate with 1 pair of pinnae; pinna with ca 5 pairs of leaflets; petiole ca 10 mm long, pubescent. Third

through sixth leaves similar to the second one only each pinna with more than 5 pairs of leaflets and the petiole becoming longer; fifth leaf with 10 pairs of leaflets and a petiole up to 14 mm long. Stipules small, 2 mm long, pubescent. Leaflets up to 2.5x8 mm, oblong, glabrous; apex rounded to minutely apiculate; base obtuse, oblique; upper surface green; under surface green or somewhat purplish. Epicotyl 2 mm long, pubescent. Internodes 10-18 mm long, pale green or somewhat purplish, pubescent.

Fig. 15. Seedling stages of *Acacia melanoxylon*: a) 1 day old; 2) 12 days old; c) 30 days old. Source: Seedlot No. 13157. Locality: Smithton, Tasmania. Germination time: 12 days.

16. *Acacia nilotica* L. var. *adansonii*

Root system with scattered laterals; taproot pale with the outer layer soon eroded and brownish. Hypocotyl pale green, glabrous, up to 25 mm long and more than 5 mm thick, swollen at its base. Cotyledons foliaceous, somewhat fleshy, ca 10x13 mm, ovate, pale green, glabrous; apex rounded; base auriculate; petiole 2 mm long, glabrous. First leaf pinnate with 8-10 pairs of leaflets; petiole ca 4 mm long; rachis ca 20 mm long. Second leaf similar to the first or bipinnate with 1 pair of pinnae; pinna with ca 10 pairs of leaflets; petiole ca 5 mm long, subulate at the apex. Third, fourth and fifth leaves bipinnate and similar to the bipinnate second leaf. Stipules spinous, ca 4 mm long. Leaflets ca 2x6 mm, oblong-ovate, green; apex rounded or minutely apiculate; base obtuse, oblique. Epicotyl not evident. Internode 3-10 mm long, green. Seedling ill-scented.

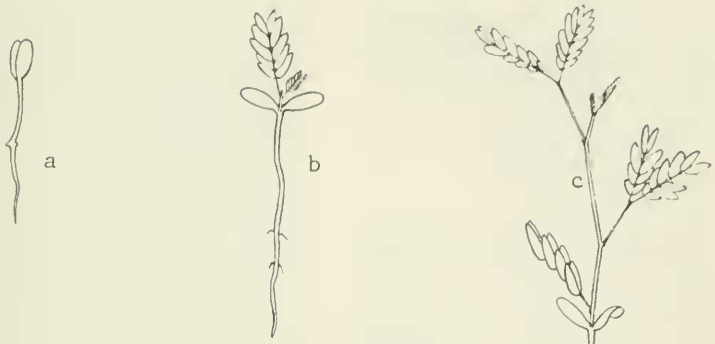


Fig. 15

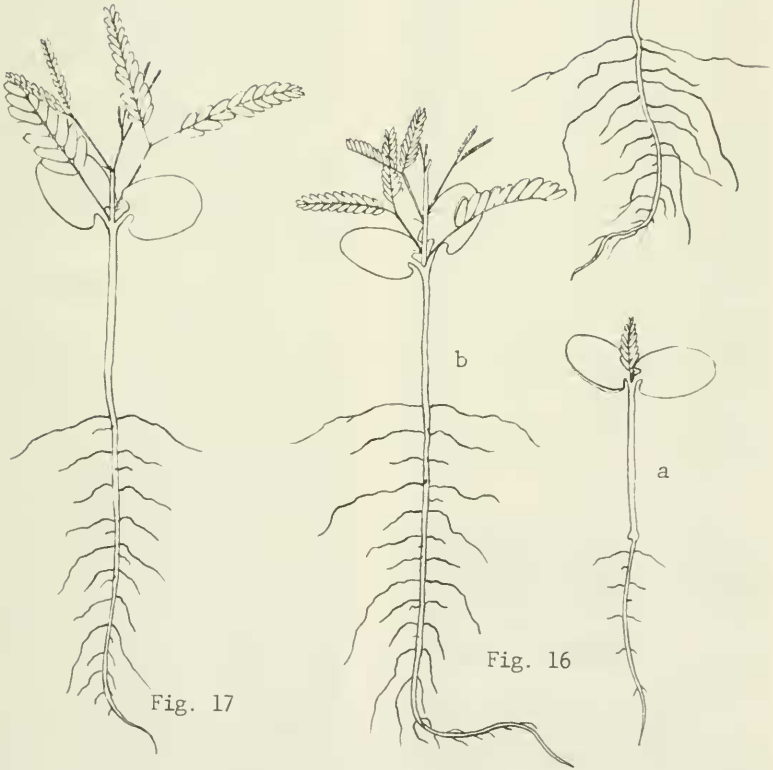


Fig. 17

Fig. 16

Fig. 16. Seedling stages of Acacia nilotica var. adansonii: a) 5 days old; b) 17 days old. Source: ISRA/CNRF (81/443). Locality: Senegal. Germination time: 8 days.

17. Acacia nilotica L. var. tomentosa

Root system with only a few laterals; taproot pale yellow, its outer layer soon eroded, dark brown. Hypocotyl pale green, glabrate to glabrous, ca 30 mm long and ca 1 mm thick. Cotyledons foliaceous, somewhat fleshy, ca 10x13 mm, ovate to orbicular, green, glabrate to glabrous; apex rounded; base auriculate; petiole ca 3 mm long. First leaf pinnate with 9-11 pairs of leaflets; petiole ca 5 mm long; rachis ca 20 mm long. Second leaf bipinnate with 1 pair of leaflets; pinna with 10 pairs of leaflets; petiole ca 10 mm long, pale green, with a subulate apex between the two pinnae. Third leaf similar to the second one. Fourth leaf bipinnate with 2 pairs of pinnae. Stipules spinous, up to 5 mm long. Leaflets ca 2x6 mm, oblong, green, glabrescent; apex rounded and minutely apiculate; base obtuse, oblique. Epicotyl not evident at the 4-leaf stage. First internode only 2 mm long; second and third internodes ca 7 mm long each, green.

Fig. 17. Seedling of Acacia nilotica var. tomentosa: 16 days old. Source: ISRA/CNRF (82/597). Locality: Senegal. Germination time: 9 days.

18. Acacia pendula A. Cunn. ex G. Don

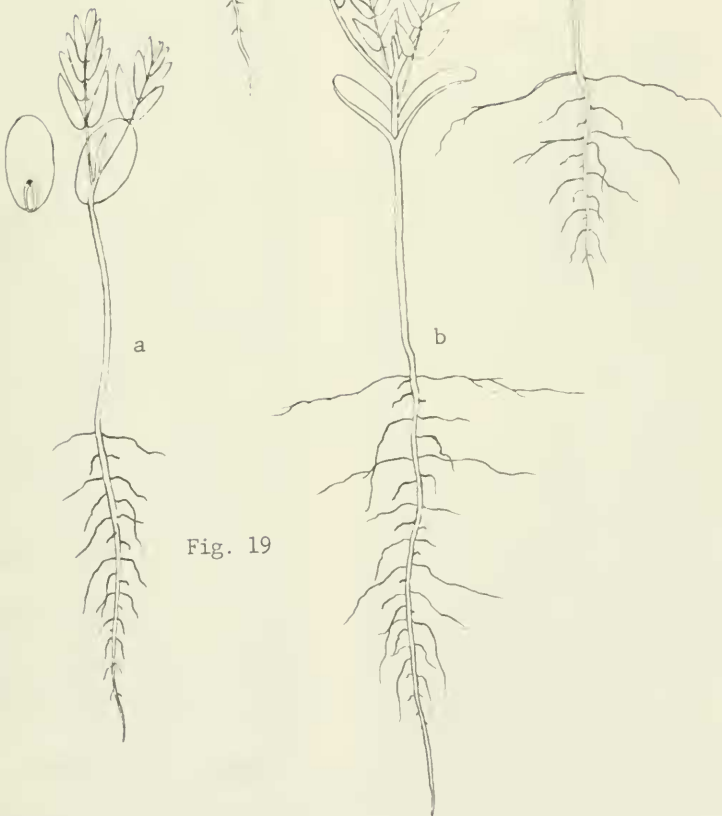
Root system with few laterals; taproot brown. Hypocotyl pale green, glabrous, 20-45 mm long. Cotyledons foliaceous, ca 7x9 mm, elliptic, glabrous; apex rounded; base minutely

auriculate, upper surface deep green; under surface pale green. First leaf pinnate with 3 or 4 pairs of leaflets; petiole ca 5 mm long; rachis ca 15 mm long, glabrous. Second leaf bipinnate with 1 pair of pinnae; pinna with 3 or 4 pairs of leaflets; petiole up to 20 mm long, glabrous. Third and fourth leaves similar to the second one only the petioles longer (exceedingly 30 mm) and becoming somewhat flattened, 1.5 mm wide. Stipules small, scale-like, pale green. Leaflets up to 2.5x9 mm, oblong to oblong-obovate, green, glabrous; apex rounded and minutely apiculate; base obtuse, oblique. Epicotyl not evident. Internodes less than 5 mm long, pale green, glabrous.

Fig. 18. Seedling stages of Acacia pendula: a) 1 day old; b) 4 days old; 11 days old. Source: Seedlot No. 13482. Locality: North of Charleville, Queensland, Australia. Germination time: 5 days.

19. Acacia peuce F. Muell.

Root system with many laterals; taproot white, its outer layer soon eroded, becoming pale yellow. Hypocotyl glabrous, pale green, up to 40 mm long, terete. Cotyledons foliaceous, somewhat fleshy, 9x12 mm-10x16 mm, elliptic or ovate, glabrous, sessile; apex rounded; base auriculate; upper surface deep green; under surface pale green. First leaf pinnate with 4 or 5 pairs of leaflets; petiole ca 8 mm long; rachis ca 12 mm long, glabrous. Second leaf similar to the first one and almost opposite to it. Third leaf with the petiole flattened to a phyllode, occasionally with a few leaflets at the top. Fourth leaf always reduced to a phyllode. Stipules scale-like, caducous. Leaflets ca 2x8 mm, oblong-lanceolate,



somewhat purplish when immature, soon green, glabrous; apex acute; base attenuate, oblique. Phyllodes linear, up to 70 mm long and 2 mm wide, green, pubescent when immature, becoming glabrous with age. Epicotyl not evident. Internode short, less than 5 mm long at the 4-leaf stage, pubescent.

Fig. 19. Seedling stages of Acacia peuce: a) 15 days old; b) 23 days old. Source: Seedlot No. 13424. Locality: Montogu Downs, Bonlia, Queensland, Australia. Germination time: 9 days.

20. Acacia polystachya A. Cunn. ex Benth.

Root system with only a few laterals; taproot pale yellow. Hypocotyl purple, glabrous, 20-30 mm long. Cotyledons foliaceous, 4x7 mm, elliptic, glabrous, soon reflexed, sessile; apex rounded; base somewhat auriculate; upper surface green and suffused with purple; under surface purple. First leaf pinnate with 4 or 5 pairs of leaflets; petiole 4 mm long; rachis ca 12 mm long, glabrous. Second leaf bipinnate with 1 pair of pinnae; pinna with 3-5 pairs of leaflets; petiole ca 10 mm long. Third leaf still bipinnate but the pinnae not as well developed as the second leaf; petiole flattened to a phyllode. Fourth leaf and on all reduced to a phyllode. Stipules scale-like. Leaflets 2x5 mm-4x10 mm, lanceolate to obovate, glabrous; apex apiculate; base obtuse, oblique; upper surface green; under surface purple. Phyllodes somewhat curved and sickle-like, 4x40 mm or more, at first purple but soon becoming green and shining; nerve and margin purplish. Epicotyl not evident. Internodes less than 5 mm long at the 4-leaf stage, purple, glabrous.

Fig. 20. Seedling stages of Acacia polystachya: a) 1 day old; b) 11 days old; c) 23 days old. Source: Seedlot No. 13500. Locality: Meilwraith Range, Queensland, Australia. Germination time: 9 days.

21. Acacia pruinocarpa Tindale

Root system with numerous laterals; taproot white, its outer layer soon eroded, becoming whitish-yellow. Hypocotyl glabrous, green or somewhat purplish, up to 30 mm long. Cotyledons foliaceous, ca 3x7 mm, elliptic, glabrous; apex rounded; base weakly auriculate; upper surface green; under surface pale green. First leaf pinnate with 5 pairs of leaflets; petiole ca 8 mm long; rachis ca 20 mm long, pubescent. Second leaf bipinnate with 1 pair of pinnae; pinna with 4 or 5 pairs of leaflets; petiole up to 25 mm long. Third leaf and on all reduced to phyllodes, occasionally with some leaflets on top of the phyllode at the 3-leaf stage. Stipules small, scale-like. Leaflets mostly 2x9 mm, oblong or lanceolate, glabrous, green; apex rounded and minutely apiculate; base obtuse, oblique. Phyllodes and flattened petioles linear, 30-50 mm long, up to 3 mm wide, attenuated at both ends, green and shining, 2- or 3-nerved. Epicotyl short. Internode may exceed 5 mm long by the 2-leaf stage, pubescent.

Fig. 21. Seedling stages of Acacia pruinocarpa: a) 1 day old; b) 11 days old; c) 35 days old. Source: Seedlot No. 7859. Locality: Wiluna, Western Australia. Germination time: 9 days.

22. Acacia saligna Wendl.

Root system with numerous laterals; taproot pale yellow. Hypocotyl at first pale green

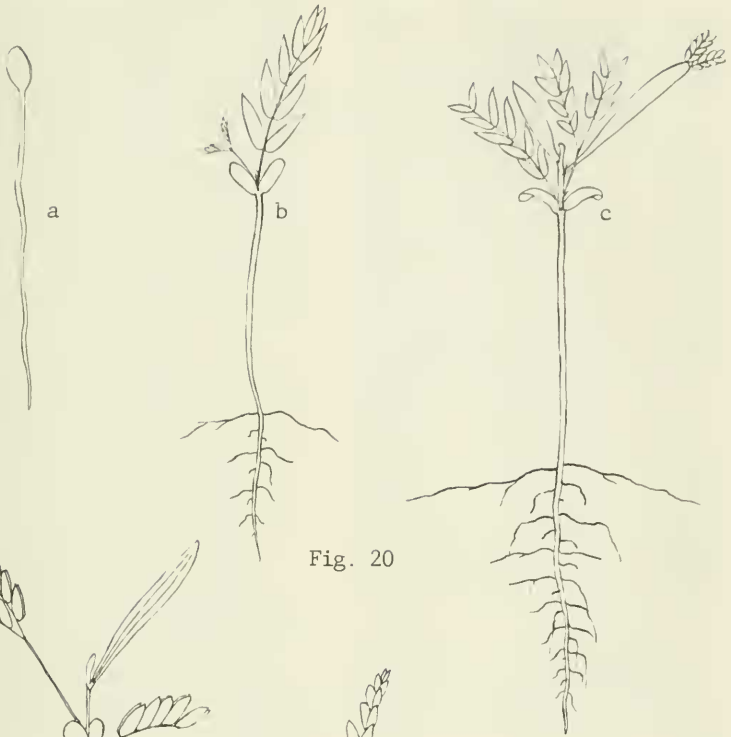


Fig. 20

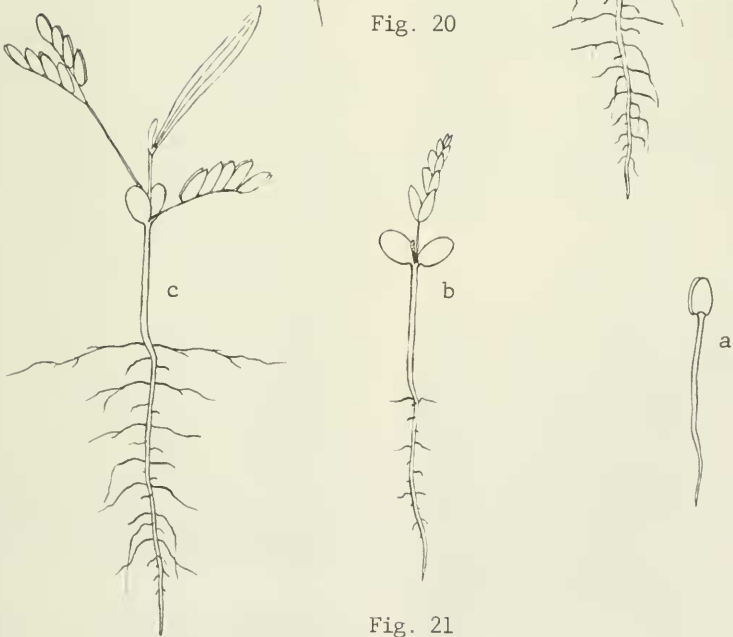


Fig. 21

and somewhat purplish, soon becoming green, glabrous, ca 20 mm long. Cotyledons foliaceous, 3x7 mm, oblong, glabrous, purple, caducous, usually dropped at the 3- or 4-leaf stage; apex rounded; base somewhat auriculate. First leaf pinnate with 3 pairs of leaflets; petiole delicate, ca 10 mm long, glabrous; rachis 5 mm long, subulate apically. Second leaf same as first one and almost opposite with it. Third leaf bipinnate with 1 pair of pinnae; pinna with 3 pairs of leaflets; petiole ca 15 mm long, apically subulate. Fourth through sixth leaves similar to the third one, but gradually changing into phyllodes. Stipules small, scale-like. Leaflets oblong, up to ca 3x7 mm, green, glabrous; apex rounded and minutely apiculate; based obtuse, oblique; margin with scattered hairs at early leaf stages. Epicotyl not evident. Internodes up to 3 mm long at 6-leaf stage, glabrous.

Fig. 22. Seedling stages of Acacia saligna: a) 1 day old; b) 2 days old; c) 5 days old; d) 23 days old. Source: Seedlot No. 11929. Locality: Weir, Western Australia. Germination time: 9 days.

23. Acacia sophorae R. Br.

Root system with only a few laterals; taproot pale yellow. Hypocotyl pale green or somewhat purplish, glabrous, up to 30 mm long. Cotyledons foliaceous, 2.5x6 mm, oblong, glabrous; apex rounded; base weakly auriculate; upper surface green; under surface pale green and somewhat yellowish. First leaf pinnate with 3 pairs of leaflets, glabrous; petiole ca 8 mm long; rachis 5 mm long, apically subulate. Second leaf bipinnate with 1 pair of pinnae; pinna with 3 or 4 leaflets; petiole sometimes flattened, ca 20 mm long. Third

leaf and above all reduced to phyllodes. Stipules small, scale-like, green. Leaflets ca 2.5x6 mm, oblong or obovate-oblong, green, glabrous; apex rounded and minutely apiculate; base obtuse, oblique. Phyllodes linear, mostly 40 mm long and 6 mm wide, attenuated at both ends, green, scattered with depressed hairs, 3-nerved. Epicotyl not evident. First internode less than 5 mm long; second internode ca 8 mm long at the 4-leaf stage, pubescent.

Fig. 23. Seedling stages of Acacia sophora: a) 3 days old; b) 8 days old; c) 18 days old. Source: Seedlot No. 11689. Locality: North of Woolgoolga, New South Wales, Australia. Germination time: 26 days.

24. Acacia tortilis Hayne

Root system with a few laterals; taproot brown. Hypocotyl pale green, glabrous, ca 20 mm long. Cotyledons foliaceous, somewhat fleshy, ca 5x10 mm, ovate, green, glabrous; apex rounded; base auriculate; petiole 3 mm long, pale green, glabrous. First leaf pinnate with 6 pairs of leaflets; petiole 3 mm long, pale green, pubescent; rachis ca 10 mm long, apically subulate. Second leaf bipinnate with 1 pair of pinnae; pinna with 6 or 7 pairs of leaflets; petiole ca 8 mm long, pale green, pubescent, apically subulate. Third, fourth and fifth leaves similar to the second one. Stipules spinose, somewhat reflexed. Leaflets 2x5 mm, oblanceolate to oblong, green, glabrous; apex rounded; base attenuate, oblique. Epicotyl not evident. Internode less than 5 mm long at the 5-leaf stage, pubescent.

Fig. 24. Seedling of Acacia tortilis: 11 days old. Source: ISRA/CNRF (82/599). Locality: Senegal. Germination time: 6



Fig. 22

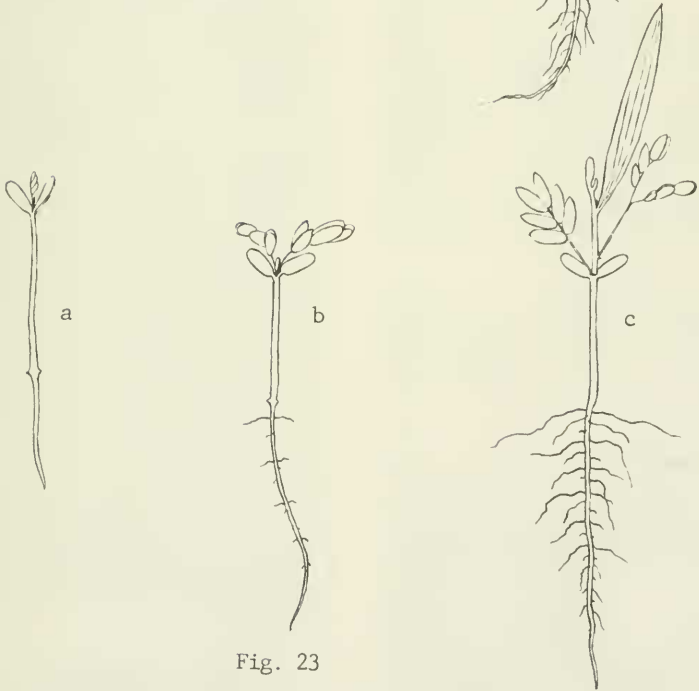


Fig. 23

days.

25. Acacia victoriae Benth.

Root system with a few laterals; taproot white. Hypocotyl pale green, glabrous, ca 20 mm long. Cotyledons foliaceous, ca 4x8 mm, elliptic, glabrous, reflexed and deciduous at the 3-leaf stage, sessile; apex rounded; base weakly auriculate; upper surface green; under surface pale green and somewhat purplish. First leaf pinnate with 4 or 5 pairs of leaflets, glabrous; petiole ca 5 mm long; rachis ca 20 mm long, apically subulate. Second leaf bipinnate with 1 pair of pinnae; pinna with 3 or 4 pairs of leaflets; petiole 5-10 mm long, scattered with depressed hairs. Third through twelfth leaves essentially similar to the second one. Stipules subulate, 1-2 mm long, stiffened when the seedling matures. Leaflets 2.5x8 mm, oblong, green, glabrous; apex rounded and minutely apiculate; base rounded or obtuse, oblique. Epicotyl not evident. Internode less than 5 mm long at the 4-leaf stage, pubescent.

Fig. 25. Seedling stages of Acacia victoriae: a) 2 days old; b) 12 days old. Source: Seedlot No. 13271. Locality: 79 km N. of Charleville, Queensland, Australia. Germination time: 8 days.

26. Bauhinia carronii F. Muell.

Root system with numerous laterals; taproot dark brown. Hypocotyl pale green, glabrous, ca 20 mm long. Cotyledons foliaceous, fleshy, ca 9x18 mm, oblong or somewhat reniform, glabrous, sessile; apex rounded; base attenuate; upper surface green; under surface pale green. Leaves pinnate with 1 pair of leaflets, or the first one simple and deeply obcordate;

petiole ca 5 mm long, apically subulate. Leaflets ca 8x12 mm, elliptic or suborbicular, green and somewhat purplish especially when young. Stipules small, lanceolate, pale green. Epicotyl conspicuous, more than 10 mm long, pale green. Internodes up to 10 mm long.

Fig. 26. Seedling of Bauhinia carronii: 6 days old. Source: Seedlot No. 11636. Locality: Birdsville, Queensland, Australia. Germination time: 30 days.

27. Bauhinia cunninghamii Benth.

Root system with numerous laterals; taproot brown. Hypocotyl thick, white, usually not growing above the soil level, glabrous, ca 5 mm long and 2 mm thick. Cotyledons foliaceous, fleshy, ca 10x14 mm, elliptic to ovate, yellowish-green, glabrous; apex rounded; base rounded and narrowed to the short petiole; First leaf scale-like or not well developed, broadly obcordate; apex divided almost to the base with each lobe rounded; base rounded. Second leaf apparently pinnate with 2 leaflets; petiole ca 4 mm long, apically subulate, sparsely pubescent; leaflets ca 5x8 mm, obovate, glabrous, green, oblique; apex rounded; base obtuse. Leaves of remaining stages similar to the second one only the leaflets gradually larger, purplish-green when young, becoming green with age. Stipules small, scale-like. Epicotyl conspicuous, ca 10 mm long. Internodes ca 10 mm long, green, at first pubescent, then the upper ones glabrous.

Fig. 27. Seedling stages of Bauhinia cunninghamii: a) 3 days old; b) 7 days old. Source: Seedlot No. 11475. Locali-



Fig. 24

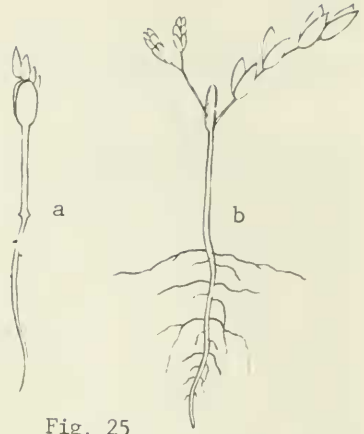


Fig. 25

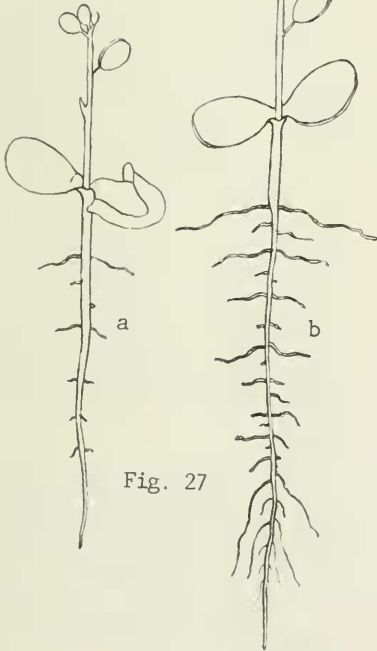


Fig. 27

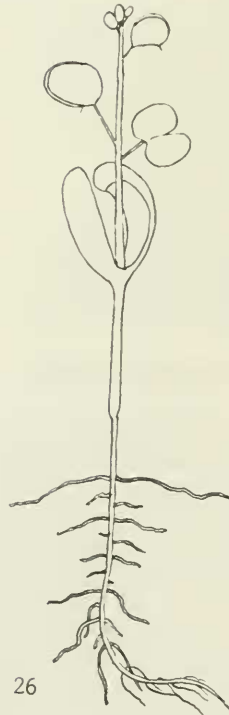


Fig. 26

ty: West of King River, Western Australia. Germination time: 40 days.

28. Cassia eremophila A. Cunn. ex Vog.

Root system with a few laterals; taproot dark brown. Hypocotyl pale green, pubescent, 15-30 mm long. Cotyledons foliaceous, ca 9x11 mm, elliptic or obovate, glabrous, 3-nerved; apex rounded; base weakly auriculate; upper surface green; under surface pale green; petiole 2 mm long. First leaf pinnat with 1 pair of leaflets; petiole 12 mm long, apically subulate; leaflets ca 5x25 mm, oblong, attenuated at both ends. Leaves of the remaining stages similar to the first leaf only the leaflets and petioles becoming longer. Fourth leaf linear and up to 40 mm long; petiole to 28 mm long. Stipules small, scale-like. Epicotyl short, less than 5 mm long. Internodes less than 5 mm long at the 4-leaf stage.

Fig. 28. Seedling stages of Cassia eremophila: a) 23 days old; b) 45 days old. Source: Seedlot No. 8643. Locality: Lightning Ridge, New South Wales, Australia. Germination time: 7 days.

29. Cassia glutinosa DC.

Root system with a few laterals; taproot dark brown. Hypocotyl pale green, glabrous, ca 20 mm long. Cotyledons foliaceous, unequal, the larger ca 9-11 mm, elliptic or orbicular, green, glabrous, rounded on both ends, conspicuously nerved. First leaf pinnate with 1 pair of leaflets; petiole ca 5 mm long, apically subulate. Leaflets ca 3x8 mm, oblong, green, glabrous; apex rounded; base obtuse or attenuate. Second to sixth leaves similar to the first leaf, only the leaf-

lets and petiole becoming longer. Sixth leaf pinnate with 2 pairs of leaflets; petiole 20 mm long, glabrous; rachis 15 mm long, glabrous. Stipules subulate, pale green. Epicotyl less than 5 mm long. Internodes less than 5 mm long at the 6-leaf stage, glabrous.

Fig. 29. Seedling stages of Cassia glutinosa: a) 1 day old; b) 23 days old; c) 45 days old. Source: Seedlot No. 11523. Locality: Hammeley Ranges, Western Australia. Germination time: 10 days.

30. Cassia nemophila Walp.

Root system with only a few laterals; taproot dark brown. Hypocotyl pale green, glabrous, 20-40 mm long. Cotyledons foliaceous, ca 8x12 mm, elliptic or obovate, green, glabrous, infrequently unequal or even with 3 cotyledons; apex rounded; base rounded and somewhat auriculate. First leaf pinnate with 1 pair of leaflets; petiole ca 8 mm long, pubescent. Leaflets 3x8 mm, oblong, pubescent. Second through sixth (occasionally eighth) leaves similar to the first only the leaflets and petioles longer, infrequently some with linear leaflets 2x25 mm at the 4-leaf stage; petiole ca 20 mm long. Seventh or ninth leaves pinnate with 2 pairs of leaflets. Stipules minute, scale-like, brown. Epicotyl less than 5 mm long, pubescent. Internodes less than 5 mm long (rarely longer) at the 4-leaf stage.

Fig. 30. Seedling stages of Cassia nemophila: a) 21 days old; b) 43 days old. Source: Seedlot No. 13479. Locality: St. George, Queensland, Australia. Germination time: 12 days.

31. Cassia oligophylla F. Muell.

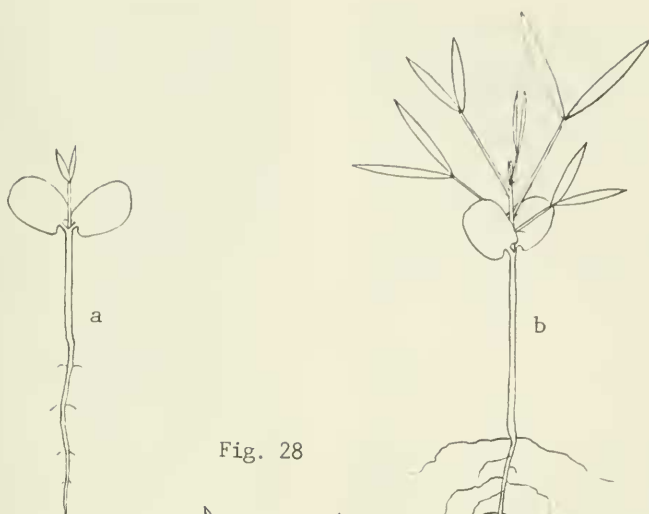


Fig. 28

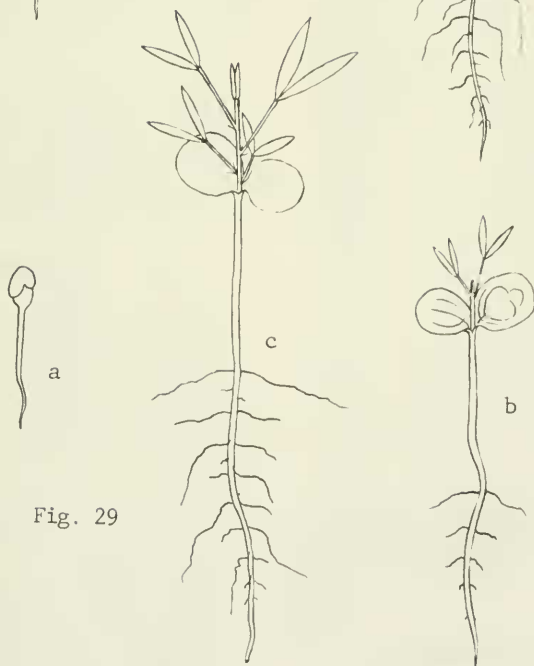


Fig. 29

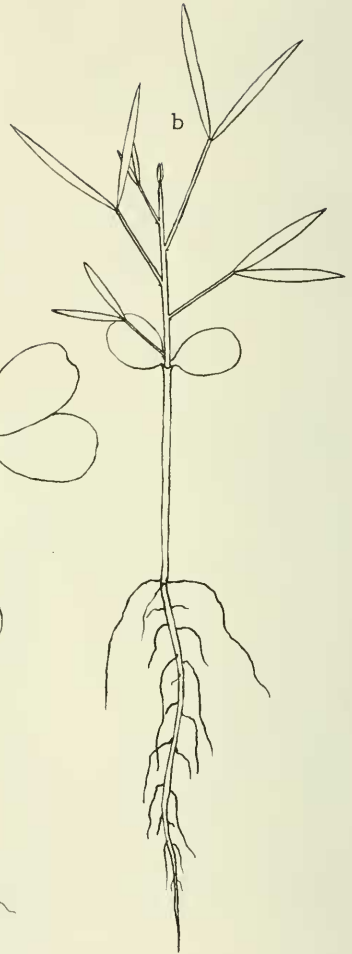
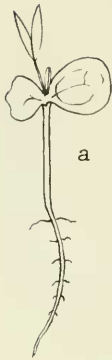


Fig. 30

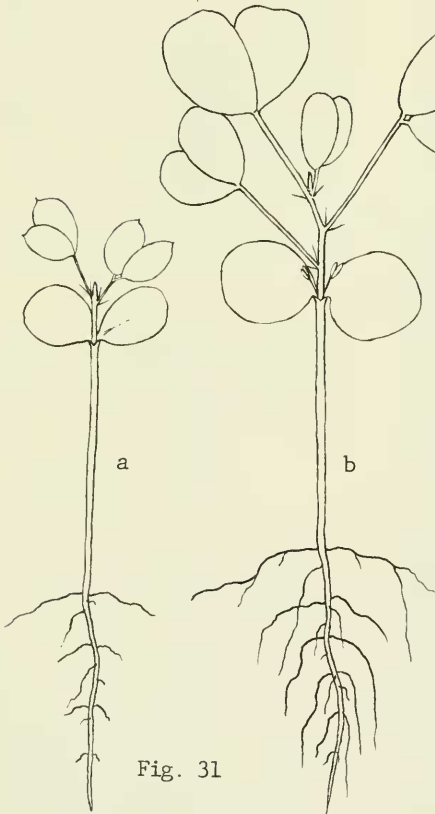


Fig. 31

Root system with some laterals; taproot dark brown. Hypocotyl pale green, glabrous, 20-40 mm long. Cotyledons foliaceous, unequal, the larger 10x12 mm-15x20 mm, green, glabrous, infrequently with 3 cotyledons; apex rounded; base rounded; petiole 1-2 mm long. First leaf pinnate with 1 pair of leaflets; petiole 10-20 mm long, pubescent, apically subulate. Leaflets 6x9 mm-10x15 mm, obovate, green; apex rounded or somewhat emarginate and minutely apiculate; base attenuate, oblique; petiolule ca 3 mm long; Second through sixth leaves similar to the first one only the leaflets larger and the petiole longer. Stipules subulate, 5 mm long, pale green, pubescent. Epicotyl less than 5 mm long. Internodes mostly more than 5 mm long at the 4-leaf stage, green, pubescent.

Fig. 31. Seedling stages of Cassia oligophylla: a) 11 days old; b) 25 days old. Source: Seedlot No. 11528. Locality: Rio Tinto Gorges, Western Australia. Germination time: 10 days.

32. Cassia venusta F. Muell.

Root system with a few laterals; taproot dark brown. Hypocotyl pale green, glabrous, 25-40 mm long. Cotyledons foliaceous, ca. 10x12 mm, obovate, green, glabrous; apex rounded or truncate; base rounded and somewhat auriculate. First leaf pinnate with 1 pair of leaflets. Second or third leaf similar to the first. Third or more frequently the fourth leaf with 2 pairs of leaflets. Leaflets 10x15 mm, obovate, green, pubescent; apex rounded or minutely apiculate; base attenuate; petiole 8-15 mm long, pubescent, apically subulate; rachis (in leaves with 2 pairs of leaflets) ca 10 mm long,

pubescent, apically subulate; petiolule short, mostly ca 2 mm long. Stipules subulate, ca 3 mm long. Epicotyl less than 5 mm long, pubescent. Internodes usually more than 5 mm long at the 4-leaf stage, pubescent.

Fig. 32. Seedling stages of Cassia venusta: a) 20 days old; b) 62 days old. Source: Seedlot No. 9701. Locality: Yantabulla and Queensland, New South Wales, Australia. Germination time: 12 days.

33. Erythrina vespertilio Benth.

Root system with numerous laterals; taproot stout, grayish-white, its outer layer soon eroded and becoming yellowish-brown. Hypocotyl stout, ca 5 mm long and 3 mm thick, subterranean, white. Cotyledons fleshy, remaining in the testa and subterranean, ca 6x20 mm, reniform, yellowish. First through fourth leaves opposite or nearly so, otherwise alternate above, simple. Fifth leaf compound with 3 leaflets. Leaflets mostly 18x30 mm, more or less rhomboid; upper surface green; under surface pale green; petioles slender, ca 20 mm long. Stipules small, lanceolate, ca 2 mm long, green. Epicotyl conspicuous, 30 mm or more long, up to 2 mm thick, pale green. Internodes up to 20 mm or more long, pale green, with scattered minute spine-like hairs on some.

Fig. 33. Seedling stage of Erythrina vespertilio: 10 days old. Source: Seedlot No. 10647. Locality: Anningie, H/Stead Road, Northern Territory, Australia. Germination time: 16 days.

34. Parkinsonia aculeata L.

Root system with numerous laterals; taproot brown. Hypo-

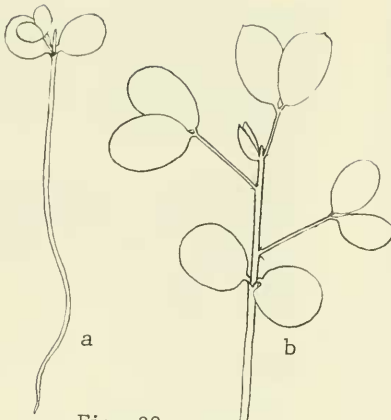


Fig. 32

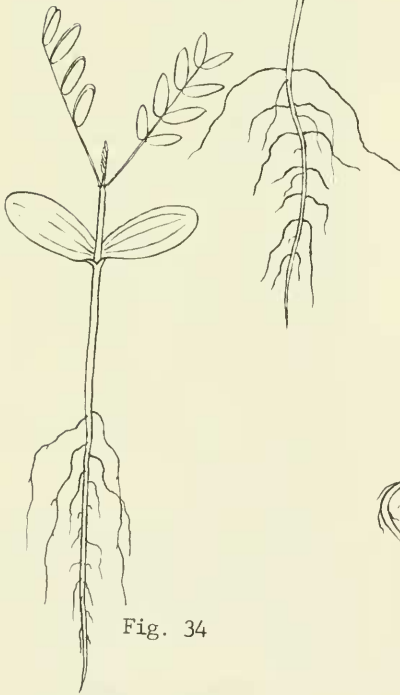


Fig. 34

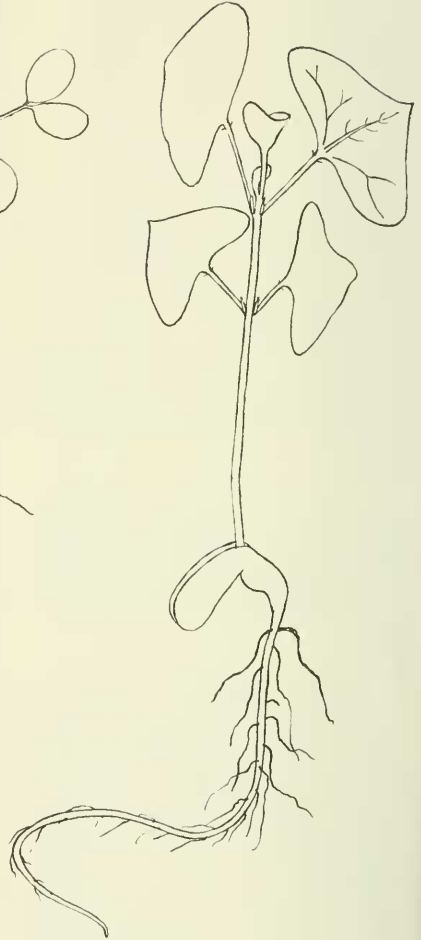


Fig. 33

cotyl pale green, glabrous, 18-35 mm long, 1-2 mm thick. Cotyledons foliaceous, somewhat fleshy, ca 8x20 mm, oblong to ovate-oblong, glabrous; apex rounded; base rounded and somewhat auriculate; upper surface green; under surface pale green, some becoming yellowish, 3-nerved. First leaf pinnate with 4 or 5 pairs of leaflets; petiole ca 10 mm long; rachis ca 20 mm long, apically subulate. Second and third leaves similar to the first only with more pairs of leaflets. Fourth leaf bipinnate with 1 pair of pinnae; pinna with ca 7 pairs of leaflets. Leaflets ca 2.5x8 mm, oblong, glabrous; apex rounded and minutely apiculate; base obtuse, oblique; upper surface green; under surface pale green. Stipules small, scale-like, glabrous. Epicotyl conspicuous, ca 10 mm long, green. First internode only up to 2 mm long; second and third internode ca 10 mm long, green, glabrous.

Fig. 34. Seedling stage of Parinsonia aculeata: a) 16 days old. Source: ISRA/CNRF, Senegal (80/258). Locality: Senegal. Germination time: 8 days.

35. Prosopis alba Griseb.

Root systems with several laterals; taproot whitish-yellow, the outer layer soon eroded, becoming yellowish-brown. Hypocotyl pale green, ca 30 mm long. Cotyledons foliaceous, ca 8x12 mm, elliptic to elliptic-ovate, glabrous; apex rounded; base auriculate; upper surface green; under surface pale green, 3-nerved; petiole ca 2 mm long. First leaf pinnate with 5-7 pairs of leaflets; petiole ca 5 mm long; rachis ca 15 mm long, apically subulate. Second leaf bipinnate with 1 pair of pinnae; pinna with 9-11 pairs of leaflets. Third and

fourth leaves similar to the second one. Leaflets ca 1.5x6 mm, oblong, green, glabrous, sessile; apex rounded and minutely apiculate; base truncate, oblique. Stipules small, scale-like, pale green. Epicotyl conspicuous, ca 10 mm long, green. Internode ca 10 mm long at the 3-leaf stage, green, glabrous.

Fig. 35. Seedling stages of Prosopis alba: a) 2 days old; b) 12 days old. Source: Texas A. & I. (0166). Locality: Not given. Germination time: 8 days.

36. Prosopis glandulosa Torr.

Root system with numerous laterals; taproot white, its outer layer soon eroded, becoming brown. Hypocotyl white, 15-20 mm long. Cotyledons foliaceous, somewhat fleshy, ca 10x12 mm, elliptic, green, glabrous; apex rounded or emarginate; base auriculate, 5- or 7-nerved; petiole ca 2 mm long. First leaf pinnate with 5 or 6 pairs of leaflets; petiole ca 5 mm long; rachis ca 20 mm long, apically subulate, glabrous. Second leaf bipinnate with 1 pair of pinnae; pinna with 4-7 pairs of leaflets; petiole ca 10 mm long. Third, fourth and fifth leaves similar to the second one. Leaflets ca 2.5x8 mm, elliptic to oblong, green, glabrous; apex rounded and minutely apiculate; base rounded, oblique. Stipules spinous, ca 4 mm long, ascendent. Epicotyl ca 10 mm long, green. Internodes ca 10 mm long at the 5-leaf stage, somewhat zigzag, glabrous.

Fig. 36. Seedling stages of Prosopis glandulosa: a) 5 days old; b) 13 days old. Source: Texas Department of Health. Locality: No given. Germination time: 10 days.

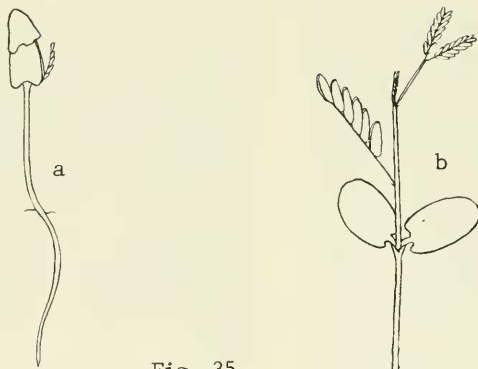


Fig. 35

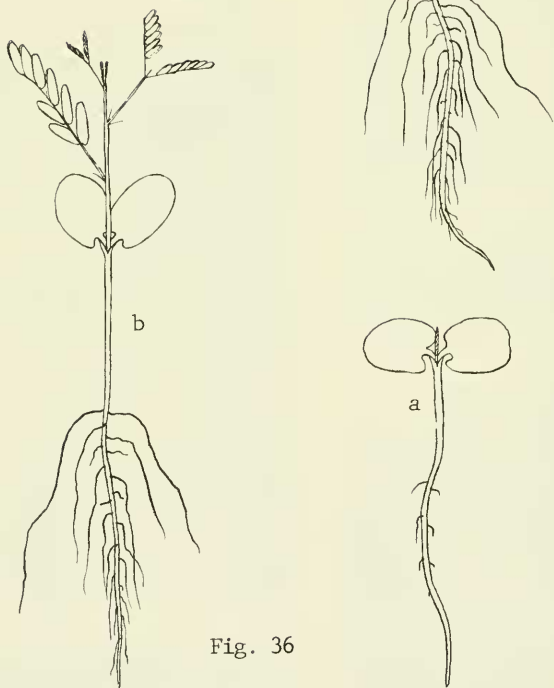


Fig. 36